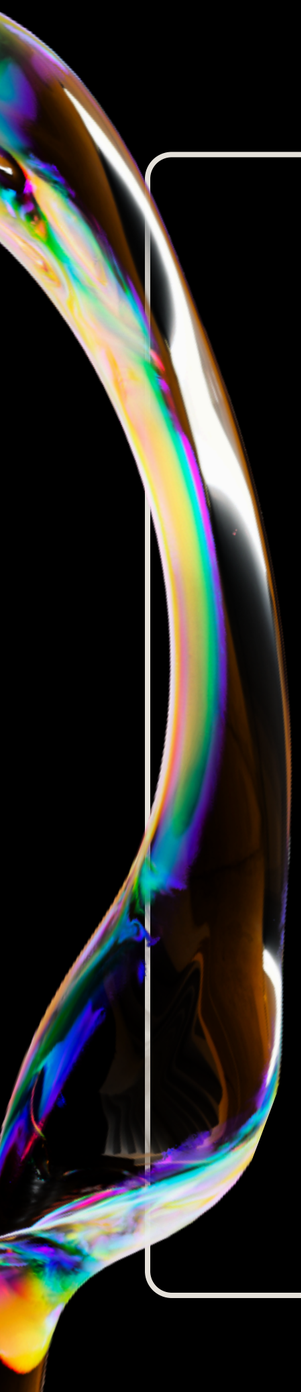
AVINYA

INNOVISTA

OPEN
INNOVATION

Real time Groundwater resource evaluation using DWLR



INTRODUCTION

We are making a project on real-time groundwater evaluation using DWLR data. We will be using an ESP32 microcontroller and an HX70AB air-pressure sensor. One end of a pipe will be inserted underground and filled with glycerin, while the other end will be sealed airtight.

As the groundwater level rises, it will push the glycerin upward, thereby compressing the air trapped above it. The change in air pressure will be measured by the HX70B1 sensor and transmitted through the ESP32 to our Firebase database, which will relay the data to our website for real-time monitoring.

Additionally, we will utilize historical DWLR data available on government portals to train machine learning models such as LSTM to predict future groundwater trends.

PROBLEM STATEMENT

Groundwater Depletion Crisis ➢➢

The U.S. Geological Survey compares the water stored in the ground to money kept in a bank account. If the money is withdrawn at a faster rate than new money is deposited, there will eventually be account-supply problems. Pumping water out of the ground at a faster rate than it is replenished over the long-term causes similar problems.

Climate Change & Unpredictable Rainfall ➢➢

Climate change can affect the intensity and frequency of precipitation. Warmer oceans increase the amount of water that evaporates into the air. When more moisture-laden air moves over land or converges into a storm system, it can produce more intense precipitation—for example, heavier rain and snow storms.

Lack of Standardized Groundwater Monitoring ➢➢

“Better monitoring means smarter decisions. It helps protect this vital resource for future generations, especially in the face of climate change and unpredictable rainfall.”

OUR INNOVATIVE SOLUTIONS

BUILD CENTRALISED MONITORING DASHBORD

Water level trends
Historical comparisons
Alert system for sharp drops

INTEGRATE WITH OTHER DATA SOURCES

AUTOMATE ALERTS AND DECISION SUPPORT

FEASIBILITY

TECHSTACK

Flutter
Firebase Fire Google Maps API for geo location Rule-based alerts
Lightweight ML (with Tensor Flow Lite)

DATA AVAILABILITY

Using open datasets like Data.gov.in and Kaggle → free, accessible Fire store stores data efficiently → scalable and real-time.

TEAM CAPABILITY

Each member has defined tasks → frontend, backend, data handling, ML exploration.

TIME CONSTRAINTS

A basic working prototype can be built in 1 week. No heavy algorithms needed, focuses on features and presentation.

VIABILITY

USER BENEFIT - Helps water resource managers track groundwater levels. Provides alerts to prevent overuse or depletion Enables planning during droughts or floods.

COST EFFECTIVENESS - Uses free tools like Firebase (within limits) Open data → no licensing cost Minimal hardware → runs on any smartphone

SCALABILITY - Designed for easy expansion → more data, more users. Cloud infrastructure allows growth without downtime ML integration can be added later as the dataset grows

SUSTAINABILITY - Promotes responsible water usage Alerts reduce waste and encourage conservation practices. Future enhancements can integrate AI-driven insights and be made available in local languages for more user friendly approach

SOFTWARE

- **Arduino IDE:**

Used to program and upload code to the ESP32 microcontroller for sensor data collection and transmission.

- **Firebase:**

A cloud platform used to store, manage, and sync real-time groundwater data, enabling live updates on the website and easy integration with other apps.

HARDWARE

- Our system uses an ESP32 microcontroller paired with an HX710AB air-pressure sensor.
- A pipe-sealed airtight at one end and filled with glycerine is inserted underground. As groundwater levels rise, they push the glycerine upward, compressing the trapped air above.
- This change in air pressure is captured by the HX710AB sensor and transmitted via the ESP32 to a Firebase Real-time Database.

GLIMPSES

Arduino IDE 2.3.6

tch Tools Help

ESP32 Dev Module

RY MANAGER

10ab.h

All

All

10AB by Rob Tillaart
.tillaart@gmail.com>
2 installed
ino library for the HX710A
HX710B 24-Bit ADC. scale,
cell, bridge, pressure
e info
2
REMOVE

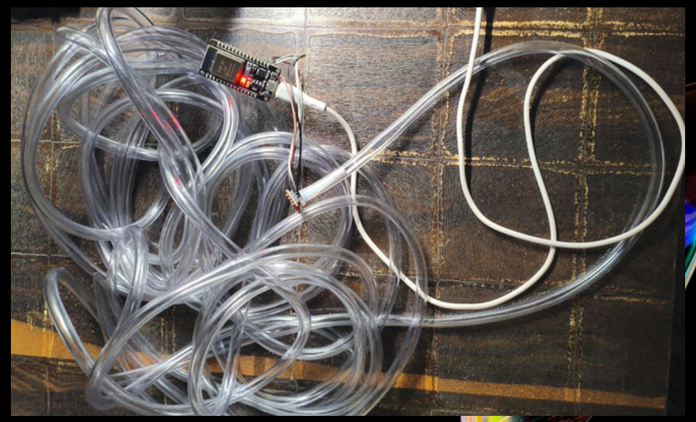
HX710AB.h.ino

```
#include "HX710AB.h"
#include <Firebase.h>

#define WIFI_SSID     "Airtel_Kapil_garg"
#define WIFI_PASSWORD "Bigtv@799"

#define REFERENCE_URL "https://console.firebase.google.com/u/0/project/realtime-groundwater-analysis/database/realtime-groun
#define AUTH_TOKEN "AIzaSyBZ7PzP1vT1Gi1c53vsX2pr61yShEz0Nvo"

Firebase_H fb(REFERENCE_URL, AUTH_TOKEN);

uint8_t dataPin = 26;
uint8_t clockPin = 27;

HX710A HX(dataPin, clockPin);sq

void setup() {
    Serial.begin(9600);

    WiFi.disconnect();
    delay(1000);

    /* Connect to WiFi */
    Serial.println();
    Serial.println();
    Serial.print("Connecting to: ");
```

Output

Compiling sketch...

CA



IMPACT AND BENEFITS

SOCIAL

IMPROVED COMMUNITY LIVELIHOODS

SUPPORTS HUMAN HEALTH

TECHNOLOGICAL

DATA DRIVEN DECISION-MAKING, FORECASTING, REAL TIME MONITORING, EARLY WARNING SYSTEMS, FOOD SECURITY AND CROP PRODUCTION

ENVIRONMENTAL

CLIMATE CHANGE MITIGATION

WATER RESOURCE MANAGEMENT

ECONOMIC

EFFICIENT IRRIGATION AND AGRICULTURE

OPTIMISED WATER USE